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REFERENCE TABLES FOR CHROMEL-KOPEL THERMOCOUPLES

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REFERENCE TABLES FOR CHROMEL-KOPEL THERMOCOUPLES

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REFERENCE TABLES FOR CHROMEL-KOPEL THERMOCOUPLES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 February 1976, after the draft finalized by the Electrical Instruments for Industrial Processes Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard is one of the series of standard reference tables for various types of thermocouples such as platinum/rhodium-platinum thermocouples. While in the other standards two tables have been given, one giving the temperature versus emf output and the other for emf output versus temperature, it has been felt that the first table giving temperature versus emf output is not necessary and hence only one table giving emf output versus temperatures has been given in this standard.

0.3 In the preparation of this standard, considerable assistance has been derived from GOST 3044-1961 'Thermocouple calibrations tables at 0°C of free ends', issued by the Komitet Standartov, Mer i Izmeritel'nyh Priborov pri Sovete Ministrov, USSR.

1. SCOPE

1.1 This standard gives the reference tables of emf-temperature relationship for chromel-kopel thermocouples.

2. REFERENCE TABLES

2.1 The reference tables for chromel-kopel thermocouples are given in Table 1.

2.2 Reference tables are based on the International Temperature Scale 1948 and the absolute volt.

3. TOLERANCES

3.1 The calibration of the thermocouple shall agree with the values given in Table 1 within the following tolerances:

Temperature Range, °C	*Tolerance*
− 50 to + 300	± 3°C
Above 300	± 1 percent

TABLE 1 CHROMEL-KOPEL THERMOCOUPLES

[Electromotive force in millivolts (absolute). Temperature in °C. Reference junction at 0°C.]

(*Clause* 2.1)

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
– 50	– 3·11											– 50
– 40	– 2·50	– 2·56	– 2·62	– 2·68	– 2·74	– 2·81	– 2·87	– 2·93	– 2·99	– 3·05	– 1·89	– 40
– 30	– 1·89	– 1·95	– 2·01	– 2·07	– 2·13	– 2·20	– 2·26	– 2·32	– 2·38	– 2·44	– 1·27	– 30
– 20	– 1·27	– 1·33	– 1·39	– 1·46	– 1·52	– 1·58	– 1·64	– 1·70	– 1·77	– 1·83	– 0·64	– 20
– 10	– 0·64	– 0·70	– 0·77	– 0·83	– 0·89	– 0·96	– 1·02	– 1·08	– 1·14	– 1·21	– 0·00	– 10
– 0	– 0·00	– 0·06	– 0·13	– 0·19	– 0·26	– 0·32	– 0·38	– 0·45	– 0·51	– 0·58	+ 0·00	– 0
+ 0	0·00	0·07	0·13	0·20	0·26	0·33	0·39	0·46	0·52	0·59	0·65	+ 0
10	0·65	0·72	0·78	0·85	0·91	0·98	1·05	1·11	1·18	1·24	1·31	10
20	1·31	1·38	1·44	1·51	1·57	1·64	1·70	1·77	1·84	1·91	1·98	20
30	1·98	2·05	2·12	2·18	2·25	2·32	2·38	2·45	2·52	2·59	2·66	30
40	2·66	2·73	2·80	2·87	2·94	3·00	3·07	3·14	3·21	3·28	3·35	40
50	3·35	3·42	3·49	3·56	3·63	3·70	3·77	3·84	3·91	3·98	4·05	50
60	4·05	4·12	4·19	4·26	4·33	4·41	4·48	4·55	4·62	4·69	4·76	60
70	4·76	4·83	4·90	4·98	5·05	5·12	5·20	5·27	5·34	5·41	5·48	70
80	5·48	5·56	5·63	5·70	5·78	5·85	5·92	5·99	6·07	6·14	6·21	80
90	6·21	6·29	6·36	6·43	6·51	6·58	6·65	6·73	6·80	6·87	6·95	90
100	6·95	7·03	7·10	7·17	7·25	7·32	7·40	7·47	7·54	7·62	7·69	100

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
100	6·95	7·03	7·10	7·17	7·25	7·32	7·40	7·47	7·54	7·62	7·69	100
110	7·69	7·77	7·84	7·91	7·99	8·06	8·13	8·21	8·28	8·35	8·43	110
120	8·43	8·50	8·58	8·65	8·73	8·80	8·88	8·95	9·03	9·10	9·18	120
130	9·18	9·25	9·33	9·40	9·48	9·55	9·63	9·70	9·78	9·85	9·93	130
140	9·93	10·00	10·08	10·16	10·23	10·31	10·38	10·46	10·54	10·61	10·69	140
150	10·69	10·77	10·85	10·92	11·00	11·08	11·15	11·23	11·31	11·38	11·46	150
160	11·46	11·54	11·62	11·69	11·77	11·85	11·93	12·00	12·08	12·16	12·24	160
170	12·24	12·32	12·40	12·48	12·55	12·63	12·71	12·79	12·87	12·95	13·03	170
180	13·03	13·11	13·19	13·27	13·36	13·44	13·52	13·60	13·68	13·76	13·84	180
190	13·84	13·92	14·00	14·08	14·16	14·25	14·34	14·42	14·50	14·58	14·66	190
200	14·66	14·74	14·82	14·90	14·98	15·06	15·14	15·22	15·30	15·38	15·48	200
210	15·48	15·56	15·64	15·72	15·80	15·89	15·97	16·05	16·13	16·21	16·30	210
220	16·30	16·38	16·46	16·54	16·62	16·71	16·79	16·86	16·95	17·03	17·12	220
230	17·12	17·20	17·28	17·37	17·45	17·53	17·62	17·70	17·78	17·87	17·95	230
240	17·95	18·03	18·11	18·19	18·28	18·36	18·44	18·52	18·61	18·70	18·77	240
250	18·77	18·85	18·93	19·02	19·10	19·18	19·27	19·35	19·43	19·52	19·60	250
260	19·60	19·68	19·76	19·85	19·93	20·01	20·10	20·18	20·26	20·35	20·43	260
270	20·43	20·51	20·59	20·67	20·75	20·84	20·92	21·00	21·08	21·16	21·25	270
280	21·25	21·33	21·41	21·50	21·58	21·66	21·74	21·83	21·91	21·99	22·08	280
290	22·08	22·16	22·24	22·33	22·41	22·49	22·58	22·66	22·74	22·82	22·91	290
300	22·91	22·99	23·08	23·16	23·24	23·33	23·41	23·50	23·58	23·67	23·75	300

(Continued)

TABLE 1 CHROMEL-KOPEL THERMOCOUPLES —*Contd*

[Electromotive force in millivolts (absolute). Temperature in °C. Reference junction at 0°C.]

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
300	22·91	22·99	23·08	23·16	23·24	23·33	23·41	23·50	23·58	23·67	23·75	300
310	23·75	23·84	23·92	24·01	24·09	24·18	24·26	24·35	24·43	24·52	24·60	310
320	24·60	24·69	24·77	24·86	24·94	25·03	25·11	25·20	25·28	25·37	25·45	320
330	25·45	25·54	25·62	25·71	25·79	25·87	25·96	26·04	26·13	26·22	26·31	330
340	26·31	26·39	26·48	26·56	26·65	26·74	26·82	26·91	26·99	27·08	27·16	340
350	27·16	27·25	27·33	27·42	27·50	27·59	27·67	27·76	27·84	27·93	28·02	350
360	28·02	28·11	28·20	28·28	28·37	28·46	28·55	28·63	28·72	28·81	28·89	360
370	28·89	28·98	29·07	29·15	29·24	29·33	29·41	29·50	29·59	29·67	29·76	370
380	29·76	29·84	29·93	30·01	30·10	30·18	30·27	30·35	30·44	30·53	30·62	380
390	30·62	30·71	30·80	30·88	30·97	31·06	31·14	31·23	31·31	31·40	31·49	390
400	31·49	31·58	31·67	31·75	31·84	31·93	32·01	32·10	32·19	32·27	32·35	400
410	32·35	32·44	32·53	32·61	32·70	32·79	32·87	32·96	33·05	33·14	33·22	410
420	33·22	33·31	33·40	33·48	33·57	33·66	33·74	33·83	33·91	34·00	34·08	420
430	34·08	34·17	34·26	34·34	34·43	34·52	34·61	34·69	34·78	34·86	34·95	430
440	34·95	35·04	35·13	35·21	35·30	35·39	35·47	35·56	35·65	35·73	35·82	440
450	35·82	35·91	35·99	36·08	36·16	36·25	36·34	36·42	36·51	36·59	36·68	450
460	36·68	36·77	36·85	36·94	37·03	37·12	37·20	37·29	37·38	37·46	37·55	460
470	37·55	37·64	37·72	37·81	37·90	37·99	38·07	38·16	38·25	38·33	38·42	470
480	38·42	38·51	38·59	38·68	38·77	38·86	38·94	39·03	39·12	39·20	39·29	480
490	39·29	39·38	39·46	39·55	39·64	39·73	39·81	39·90	39·99	40·07	40·16	490
500	40·16	40·25	40·33	40·41	40·51	40·60	40·68	40·77	40·86	40·94	41·03	500

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
500	40·16	40·25	40·33	40·41	40·51	40·60	40·68	40·77	40·86	40·94	41·03	500
510	41·03	41·12	41·21	41·29	41·38	41·47	41·56	41·65	41·73	41·86	41·91	510
520	41·91	42·00	42·10	42·17	42·26	42·35	42·44	42·53	42·61	42·70	42·79	520
530	42·79	42·88	42·98	43·06	43·14	43·24	43·32	43·42	43·50	43·58	43·68	530
540	43·68	43·76	43·85	43·94	44·02	44·12	44·20	44·30	44·38	44·46	44·56	540
550	44·56	44·64	44·74	44·82	44·92	45·00	45·09	45·18	45·27	45·36	45·45	550
560	45·45	45·54	45·63	45·72	45·81	45·90	45·98	46·07	46·16	46·25	46·34	560
570	46·34	46·43	46·52	46·61	46·70	46·79	46·87	46·96	47·05	47·14	47·23	570
580	47·23	47·32	47·41	47·50	47·59	47·68	47·76	47·85	47·94	48·03	48·12	580
590	48·12	48·21	48·30	48·39	48·48	48·57	48·66	48·75	48·84	48·92	49·02	590
600	49·02	49·11	49·19	49·28	49·37	49·46	49·55	49·64	49·72	49·81	49·90	600
610	49·90	49·99	50·08	50·16	50·25	50·34	50·43	50·52	50·60	50·69	50·78	610
620	50·78	50·87	50·96	51·04	51·13	51·23	51·31	51·40	51·48	51·57	51·66	620
630	51·66	51·75	51·83	51·92	52·01	52·10	52·18	52·27	52·36	52·44	52·53	630
640	52·53	52·62	52·71	52·79	52·88	52·97	53·06	53·15	53·23	53·32	53·41	640
650	53·41	53·50	53·58	53·67	53·76	53·85	53·93	54·02	54·11	54·19	54·28	650
660	54·28	54·37	54·45	54·54	54·63	54·72	54·80	54·89	54·98	55·06	55·15	660
670	55·15	55·24	55·32	55·41	55·50	55·59	55·67	55·76	55·85	55·94	56·03	670
680	56·03	56·12	56·20	56·29	56·38	56·47	56·55	56·64	56·73	56·81	56·90	680
690	56·90	56·99	57·07	57·16	57·25	57·34	57·42	57·51	57·60	57·68	57·77	690
700	57·77	57·86	57·94	58·03	58·12	58·21	58·29	58·38	58·47	58·55	58·64	700

(*Continued*)

TABLE 1 CHROMEL-KOPEL THERMOCOUPLES — *Contd*

[Electromotive force in millivolts (absolute). Temperature in °C. Reference junction at 0°C.]

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
700	57·77	57·86	57·94	58·03	58·12	58·21	58·29	58·38	58·47	58·55	58·64	700
710	58·64	58·73	58·81	58·90	58·99	59·08	59·16	59·25	59·34	59·42	59·51	710
720	59·51	59·60	59·68	59·77	59·85	59·94	60·03	60·11	60·20	60·28	60·37	720
730	60·37	60·46	60·54	60·63	60·72	60·81	60·89	60·98	61·07	61·15	61·24	730
740	61·24	61·33	61·41	61·50	61·59	61·68	61·76	61·85	61·94	62·02	62·11	740
750	62·11	62·20	62·28	62·37	62·45	62·54	62·63	62·71	62·80	62·88	62·97	750
760	62·97	63·06	63·14	63·23	63·31	63·40	63·49	63·57	63·66	63·74	63·83	760
770	63·83	63·92	64·00	64·09	64·18	64·27	64·37	64·44	64·53	64·61	64·70	770
780	64·70	64·79	64·87	64·96	65·04	65·13	65·22	65·30	65·39	65·47	65·56	780
790	65·56	65·65	65·73	65·82	65·90	65·99	66·08	66·16	66·25	66·33	66·42	790
800	66·42	—	—	—	—	—	—	—	—	—	—	—

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